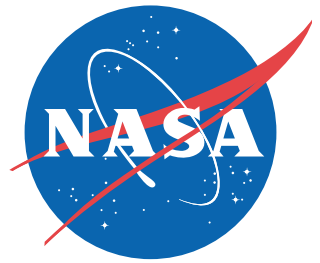


NASA Facts

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2001 Mars Odyssey

NASA's next mission to Mars will be an orbiting spacecraft designed to find out what the planet is made of, detect water and shallow buried ice and study the radiation environment.

The surface of Mars has long been thought to consist of a mixture of rock, soil and icy material. However, the exact composition of these materials is unknown, except for the few specific locations where spacecraft have landed and taken measurements. Current observations from the Mars Global Surveyor spacecraft are changing the way scientists think about Mars.

Mission Overview

On April 7, 2001, the 2001 Mars Odyssey is scheduled for launch on a Delta II launch vehicle from Cape Canaveral, Florida and will arrive at Mars in October 2001. After firing its main engine to slow itself enough to be captured by Mars' gravity, the orbiter will initially circle the planet once every 25 hours. Over the next 76 days, the spacecraft will gradually edge closer to Mars, using the friction of the atmosphere to lower its orbit (a technique called aerobraking) until it reaches a 2-hour science orbit. Without aerobraking, the spacecraft would need to carry much more fuel.

Science Goals

The orbiter mission will study and globally map the elemental composition of the surface.

Determining the surface mineralogy and the abundance of hydrogen in the shallow subsurface are key goals. The orbiter will also provide information on the structure of the Martian surface and about the geological processes that may have caused it. Finally, the orbiter will take important measurements of the planet's radiation environment that can be used to evaluate the potential health risks to future human explorers.



Science Instruments

The orbiter will carry three science instruments: The Thermal Emission Imaging System (THEMIS), the Gamma Ray Spectrometer (GRS), and the Mars Radiation Environment Experiment (MARIE).

Studying Minerals and Temperature

The thermal emission imaging system will collect images that will be used to identify the minerals present in the soils and rocks at the surface. The system will obtain images of the surface in the thermal infrared portion of the electromagnetic spectrum. Minerals observed in this part of the spectrum, which is invisible to the human eye, have distinct absorption features that will allow them to be identified in the false color images. The imaging system will support mineral mapping by the Thermal Emission Spectrometer (TES) instrument on the Mars Global Surveyor spacecraft — already at Mars — by observing at the same infrared wavelengths but at higher spatial resolu-

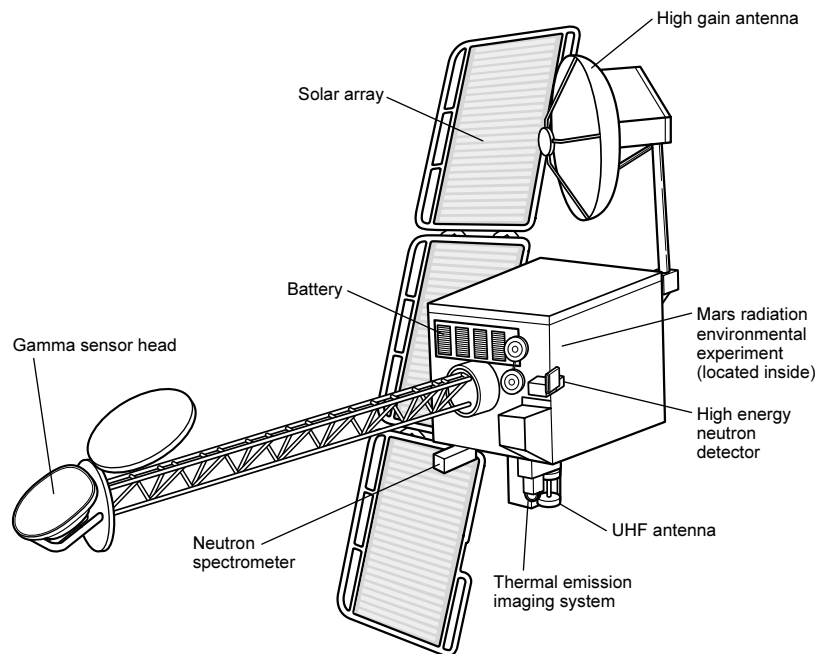
tions. By looking in the visible wavelength at the shape of the Martian landscape and determining the characteristics of rocks, dust, sand, and soils, the thermal emission imaging system will also study small-scale geologic processes and landing site characteristics. The instrument will search for dry lakebeds and hydrothermal areas much like the ones in Yellowstone National Park. It will also search for temperature differences due to heat that may be coming from active volcanic areas or hot springs.

Studying Water Ice and Elements

The gamma ray spectrometer will be able to measure the amount of hydrogen in the upper meter of soil across the whole planet. Because the amount of water can be determined from the concentration of hydrogen, this measurement will help us understand how much water may be available for future explorations, as well as give us clues about the planet's climate history. The spectrometer is very sensitive to detecting elements such as sodium, potassium, and chlorine, and it will be able to see if salts have been deposited in areas thought to be dry lakebeds or ancient sea bottoms. The spectrometer will also determine the thickness of the seasonal polar ice deposits as they grow and shrink each year. The instrument will determine the abundance of major elements such as oxygen, iron, silicon, and aluminum. When compared to the solar ratio from which our solar system formed, the ratio of certain key elements (potassium and thorium) will tell us much about the planet's early history. By searching the planet for silicon-rich rocks, the spectrometer will provide key information about the composition and evolution of the Martian interior.

Studying the Radiation Environment

The radiation experiment will collect data on the radiation environment in space near Mars to help assess potential risks to any future human



explorers. The instrument consists of an energetic particle spectrometer that can measure the elemental energy spectra of charged particles.

Mars Communications Relay

The orbiter will also provide the capability to store and relay data to Earth from future spacecraft that land on Mars.

Project/Program Management

The 2001 Mars Odyssey is managed for NASA by the Jet Propulsion Laboratory, a division of the California Institute of Technology, Pasadena. JPL's industrial partner is Lockheed Martin Astronautics in Denver, Colorado. At NASA Headquarters, Mark Dahl is the 2001 Mars Odyssey program executive and Dr. Michael Meyer is the program scientist. At JPL, George Pace is the project manager and Dr. Stephen Saunders is the project scientist.

Scientific instruments will be operated by principal investigators from the University of Arizona (GRS), Arizona State University (THEMIS), and NASA's Johnson Space Center (MARIE).

For more information: <http://mars.jpl.nasa.gov>

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